

## Meeting Minutes

for the 1<sup>st</sup> expert meeting of IHRA pedestrian protection  
15-16 July 1997, Tokyo

### **Day 1 (Tuesday 15 July) Japan Light Motor Vehicle Inspection Organization, Tokyo, Japan**

#### **1. Opening of the meeting**

The meeting Convener, Mr. Mizuno opened the meeting at 9:30 and Mr. Matsumoto with MOT welcomed delegates by stating the objectives and a need for this harmonized activity for the time frame of 5 years starting with ESV Conference 1996 in Melbourne aiming at the harmonized regulation for the next century.

- Confirmation and numbering of the documents  
(See attached sheet Appendix 1)

Mr. Sasaki briefly confirmed all documents and JASIC secretariat numbered them.

#### **3. Roll call of delegates**

(See attached sheet Appendix 2)

#### **4. Adoption of meeting agenda**

The body approved the agenda, Doc. IHRA/PS/15, without change.

#### **5. Appointment of the editing committee**

Mr. Saul was appointed the editing member.

#### **6. Explanation of the progress from the first IHRA committee meeting**

The Convener reviewed the progress of IHRA after ESV Conference 1996.

The Convener indicated that we need to propose a reasonable harmonized test procedure to ESV Conference 2001.

#### **7. Introduction and discussion of the draft plan**

Mr. Sasaki briefly explained draft plan. (Doc. IHRA/PS/3 )

The Convener asked if there is any question or comment concerning draft plan which had been delivered in advance.

Mr. Lawrence requested to see the draft plan page for page. He questioned if the task for the test procedure is already decided under the “Purpose” . He further raised the point that we have no definition of “Passenger vehicle”. A coach and bus could be a passenger vehicle.

The Convener proposed to discuss the definition of “passenger vehicle” later.

Mr. Saul wished to clarify the “Purpose” prescribed in the draft plan, and asked if this purpose had been decided by ESV Conference 1996, and what direction of test procedure might be up to working group.

The Convener spoke of the main task of this working group which is to propose the appropriate test procedure, referencing the two test procedures, EEVC’s and ISO’s.

Mr. Bartolo questioned if there is to be discussion at ESV to recommend a criteria or injury requirement.

The Convener interpreted the working group position is that the criteria or requirement doesn’t see a need for our task. The issue should be addressed by regulatory agencies in individual countries.

Mr. Lawrence, however, indicated that if this test procedure is to be used in regulation, it should include a requirement.

Mr. Saul felt that the criteria or requirement might be secondary issue, at least we need to have the unified test procedure among the different countries that they can possibly set different tolerance level.

Mr. Lawrence pointed out that we propose some guidance, if we use HIC1000 as a target to prevent fatal wound which has been prevalingly accepted. We need to specify more accepted criteria for some guidance so that political decision can be made.

Mr. Lawrence requested clarification on terminology of “*technical standard*” quoted in the page 2-2, stating *technical standard* seems to be different from regulation, and makes him in confusion, while the body assumes this term “*technical standard*” and regulation are all but same meaning.

The Convener indicated that “*technical standard*” meant the technical regulation in this context.

The Convener asked, in this connection, English native speakers out of delegates to correct inappropriate words used in the paper, since it’s not easy to use foreign language properly.

Mr. Saul indicated that we are approaching the research aspect, and developing and the underlying information of research and testing procedures that various countries might use, and the second step, could be to develop their technical procedures or technical standards in the various countries focusing on research and agreement on how each country does it for the technical standards.

Mr. McLean raised a question regarding the last sentence of “EC/EEVC/WG10” on page 2, and indicated that working group should concentrate on vehicle factors and the interaction between pedestrian and passenger car, and like to suggest the group might consider and propose IHRA a view that this would be outside of scope of this committee, regardless of development of traffic safety facilities or education on pedestrian / driver.

The Convener, however, interpreted that although this working group should deal with vehicle side, we need to be aware of scope of responsibility taken by vehicle itself.

Mr. Jaehn indicated that we want to develop the test procedure, and we have to assess the benefit of such test procedure, at least we should know that the test procedure will be happen if we use this.

Mr. Yamaoka basically accepted to concentrate on the vehicle side, but raised one point that we need to be in common recognition that the issue on pedestrian safety may not be easily resolved by merely addressing vehicle responsibility. Also, suggesting that we need to set it forth as a premise that the scope of the responsibility for what vehicle should take need to be addressed in advance for pedestrian safety substantially.

Mr. Lawrence also acknowledged the need for our encouragement of improvement of infrastructure and that will lead to reduce the fatalities in fact. The task of this working group is to look at the vehicle separating the issue from the other.

Mr. Saul indicated that each country has own expertise for infrastructure and education that might be more benefit and more important in one country than

another.

He felt that US probably is important too, they somehow address cost-benefit in the future combined with infrastructure / education. It will be possibly general way to address the combined factors that results in benefit in US.

Mr. McLean introduced their in-depth study with since mid 1980's for head injuries research in Australia. They have conducted detailed investigation of 200 fatal pedestrian accidents that they made a guesswork and estimated that speed reduction by 5-10km/h to 50km/h from 60km/h in the urban area, might be effective in 1/3 reduction pedestrian fatalities cases. He consequently pointed out that a significant majority of fatal pedestrian crashes involve the pedestrian striking the front of the vehicle, and that design changes to the front of the vehicle which reduced the severity of impact between the pedestrian will reduce the number of fatalities in Australia.

Mr. McLean recommended that the working group reports to parent committee IHRA that speed changes conceivably could be desirable, but as a piece of evidence the working group has nothing more to do.

## **8. Presentations from experts on this project**

Mr. Lawrence raised a question why the draft plan included the infrastructure / education, this working group should be directed more at test procedure.

Mr. McLean also supported Mr. Lawrence's opinion.

In answer to this question, the Convener replied that the matter of infrastructure is to be dealt "slightly" as a general topic to define the responsibility owned by vehicle from the perspective of pedestrian safety, stating further that the main objective is to study the test procedure though.

Mr. Sasaki understood the difficulty to contain the infrastructure in the plan, since the situation at every country is different, and proposed the infrastructure to be got rid of the plan.

Mr. Saul felt that the issue on who and which country should take responsibilities is serious, and it must be important for policy makers, but cost-benefit and infrastructure is going to be different each country.

Mr. Saul proposed making infrastructure stay there but with less burden due to no expertise available. He felt it would be interesting to make sure the effectiveness

from NHTSA perspective, having faced their problem in place that deals not only with crash injury but also with educational infrastructure, how they are going to handle on the federal highway.

The Convener proposed, having supported Mr. Saul's opinion, that the matter of infrastructure is to be dealt "slightly" in "introduction" or the like to remind government or concerned people the importance from the perspective of pedestrian safety, stating further that the main objective for this working group is to study the test procedure.

The body agreed with the Convener's proposal, but Mr. McLean questioned further if the working group is going to do some work here on the road infrastructure for pedestrian safety or rather merely acknowledge the importance.

Mr. McLean spoke of his intention not to contribute to some work on infrastructure, but acknowledge the importance of test procedures by reviewing the study.

The Convener confirmed that the proposed study on infrastructure should be deleted from the work plan, but acknowledge the importance of infrastructure in "introduction" or make a report to parent committee from the perspective of pedestrian safety.

The Convener Also asked Mr. Lawrence to make a proposal to draft his plan touching on infrastructure so as to be circulated at the next meeting.

Mr. Lawrence agreed with the Convener's request.

Mr. Jaehn raised a question, in connection with re-drafting, if it's available to revise the original once authorized by steering committee IHRA.

The Convener predicted it could be available.

Mr. Saul requested to clarify the meaning of next meeting whether re-writing on article 5-4 should be for tomorrow meeting or for the meeting of 6 months ahead.

The Convener replied inappropriately, seems like misunderstanding, stating after receiving the revised draft from Mr. Lawrence, they are going to circulate for your comments.

Mr. Lawrence questioned if the Convener is requesting the correction of whole plan or section 5-4.

The Convener asked him to re-draft the infrastructure related parts out of the plan.

Mr. McLean proposed to re-write any modification by tomorrow meeting, to maximize efficiency.

**---- Present situation of research on Pedestrian safety in each country**

Mr. Lawrence reported the history and status of EEVC test procedures.

- (1) EEVC working group 10 started in 1989, carried out research program sponsored by EU until 1990. They did Mathematical model, impactor development, development of test procedure etc.
- (2) In 1991, working group actually developed the 1<sup>st</sup> test method as the Directives producing the 1<sup>st</sup> prototype leg form bumper impactors with artificial knee joint and child / adult headform bonnet impactors.
- (3) In 1992, they produced Draft Directives which modified the exterior projections.

They found that cost studies done by Industries showed negative benefit.

- (4) From 1992 thru 1994, working group continued the improvement to evaluate the test method and impactors, including evaluation of current vehicles.
- (5) From 1993 thru 1994, TNO produced cost benefit studies which showed small benefit.
- (6) In 1994, EEVC working group produced the final report.
- (7) To date, TRL, TNO and BAST were working to improve the test tools. In 1995, Total test were improved and sent to EU.
- (8) In 1996, Draft Directives were drawn up for EU.

Mr. Lawrence reported that at the 1<sup>st</sup> meeting to discuss Draft Directives with EU there was big conflict between “Cost Benefit Research Institute” and Industries, the former find it to be positive benefit, while the latter small benefit. Commission accordingly decided to entrust UK MIRA with look at all the cost benefit studies assessment. Mr. Lawrence believes Draft Report from MIRA was already submitted to Commission.

Now that they have test procedure developed, and the test tools were available already, Mr. Lawrence felt that one of important jobs for working group will be to look at the different requirements from Europe and worldwide requirements. And also see whether any speed changes, additions so on like requirement of big vehicles in US, and Mr. Lawrence indicated that there was no test procedure and

tools for child chest yet.

Ms. Brun-Cassan raised some questions, indicating the accident logical data used in study by Working Group 10 was rather old, and shape of the cars has been changed. From recent accident studies we can't result in not being realistic in France.

Ms. Brun-Cassan also indicated that the studies by Institute does not estimate the re-design cost of vehicles, although cost benefit studies made by both Industries and Research Institute were much different each other, according to Mr. Lawrence's report.

Mr. Lawrence replied to her question on the car shape that car shape has little changed worldwide, according to their int'l study.

Mr. Bartolo reported the current status of AAMA as follows:

- (1) They currently do not have task force committed to pedestrian safety for the concerned international safety.
- (2) AAMA is interested in the discussions and developments involving pedestrian safety, especially as it relates to vehicle design parameters, accident analysis and the regulatory environment. Pedestrian safety, including the reduction of accidents and the likelihood of injury is a major challenge for all automobile manufacturers and regulators.

Mr. Saul gave a presentation on recent research concerning pedestrian safety in US

- (1) US has not done much research with reference to Head impact since 1991
- (2) Pedestrian accident fatalities & injuries are declining since 1979, it was likely to a certain extent attribution of education.
- (3) Pedestrian Crash Data Study (PCDS) started in 1995 with a view to analyze injury causes, severity trends.
- (4) Trying look at what kind of WAD exists today to determine head impact location in comparison with '70s vehicle, and also with ISO standards.
- (5) Last year they have developed leg impactor, and they initiated this not being flexible plant type of impactor. Although it's desirable to be able develop impactor that is in compliance with ISO requirements. They are measuring bending angle moment, knee measuring shear strength, lower leg contact force

of the impactor-wise.

- (6) Basically the approach they've taken is to build in moment requirements of ISO standards, friction faces can control moment response and the initial result was close to ISO requirements with moment response. They built rubber shear element, and not successful for the 1<sup>st</sup> prototype.
- (7) As for future effort they look at shear measurements and instrumentation to improve them that calibrate them to meet ISO standards with vehicle testing targeted for the end of this year

In his closing remarks, Mr. Saul suggested that it's important to demonstrate benefit in some stage, though he has no specific idea how to promote pedestrian safety project.

Mr. Saul interpreted the American Government position on pedestrian full scale dummy which same foreign country seems to have addressed to develop as follows: We had indicated our response that it would not be until agreement, share & responsibilities are to be taken by the countries world wide, looking at proposal for pedestrian dummy, brainstorming the issue that we certainly have it put in.

Mr. Jaehn questioned if Mr. Saul is trying to develop a pedestrian friendly vehicle near to serious products, in regard to "demonstration of benefit to promote the project" suggested by Mr. Saul.

Mr. Saul guessed he doesn't know what is going on this matter, but repeated what he spoke of vehicle testing based on ISO requirements.

Mr. Jaehn questioned him further how to measures the benefit, i.e. if there is benefit by applying to requirements, or benefit by something else.

Mr. Saul felt that organized accident information really tell us, although he doesn't have any concrete idea.

Mr. McLean reported pedestrian fatalities in Australia, referencing Doc. IHRA/PS/16 as follows:

- (1) The number of people killed has dramatically decreased by 47% from 1970 to 1995.
- (2) 401 pedestrian, however, were killed in 1995 on Australian roads, and pedestrian fatalities represented 20% of all people killed on road.
- (3) Pedestrian crashes cost the Australian community nearly A\$1.0 billion each



year.

- (4) There was almost double fatalities in male in comparison with female in 1992.
- (5) Children (defined as 16 or younger) make up 15%, and children under 6 years account for only 4% of the total.
- (6) The elderly are far more risk with 40% of all pedestrian fatalities over the age of 60 years, conceivably due to their inability of running, eyesight, listening the like as for accident causation.
- (7) In 30% of fatal pedestrian crashes, the death of the pedestrian is instantaneous, a further 16% die before they reach hospital and 53% die in hospital.
- (8) Over 2/3 of pedestrians suffered serious head injuries while 47% had serious chest injuries.
- (9) As for crash site characteristics, nearly 2/3 of pedestrian crashes occurred on road where the speed limit is 60km/h or less. 60km/h is the general urban speed limit in Australia as he mentioned today in the above context.
- (10) As for point of impact on the vehicle, the majority (84%) of pedestrian fatalities involve the pedestrian being struck by the front of vehicle.
- (11) Nearly half number of vehicles braked before striking pedestrian.
- (12) As far as impact test is concerned, conceivably some consideration should be given in lower leg & knee impact test with bumper with a free speed or braking.
- (13) Under harm reduction, design changes to the front of the vehicle which reduced the severity of impact between the pedestrian, especially the head of the pedestrian, and the body of the vehicle could assist in reducing the number of fatal outcomes in such crashes.
- (14) The Federal Office of Road Safety has initiated a research program to assess the potential benefits from pedestrian-friendly vehicle design.

That program has been conducted by Mr. McLean's research unit and currently at stage of having aim, functioning head form which we will project EEVC head form and vehicle.

In reference to Doc. IHRA/PS/17, Mr. McLean stated that even if significant improvement results from "infrastructure" development, one can continue to expect each year about 25 to 30 deaths and 600 to 700 serious injuries among Australian pedestrians aged 5 to 12.

In his closing remarks, Mr. McLean indicated concerning accident investigations that his research unit is coincidentally being fronted to collect data on pedestrian collisions during current financial year which starts this month.

Mr. Sasaki questioned if Mr. McLean has data concerning the impact speed, making a quotation from Table 1 (Number of fatal collision in 1992 involving pedestrians aged 5 to 12, by road type and speed limit at site of collision).

Mr. McLean answered “Yes” having guessed from his memory, half cases in general must have past 60km/h based on 152 investigations estimated impact speed, as this table shows simply “speed limit at the site”.

Mr. Jaehn brought the issue up as a current topic in Europe, stating hard controversy between industries and TRL. They are dealing some investigations on infrastructure measures. And in addition, they offered cost benefit studies especially on EU Draft Proposal where there was big difference between ours and TRL.

Mr. Jaehn raised a question concerning the controversial cost-benefit if TRL can estimate to materialize the vehicle without experiencing to develop the vehicles while all of us have estimated figures.

Mr. Lawrence urged that estimate was made by car design consultant, not by TRL.

Ms. Brun-Cassan pointed out that they don't care car design individuality of cars.

Mr. Jaehn added his comments that even industries are investigating the problem of the style, taking the cost into account.

Mr. Jaehn indicated that they are not ready to use Draft Proposal from European Commission due to some problems with impactors, i.e. repeatability & reproducibility, referencing their own studies.

Mr. Lawrence indicated that they have assessed the repeatability of impactors, all the impactors are very repeatable. The test procedure is rather problem, there is some very minor problem about head impactor, and leg impactor too, but will be completed by next month. Those impactors are being used in UK car assess program, and no problem using them in the test method.

Mr. Jaehn and Ms. Brun-Cassan, however, denied the test repeatability of impactors.

Mr. Lawrence urged the test repeatability of impactor, stating impactors are

themselves repeatable. They found problem in cars which may cause impactors not repeatable. Repeatability varies in cars.

Mr. Jaehn deferred argument till tomorrow for further detailed discussion.

Mr. Sasaki outlined recent research on pedestrian protection conducted by JAMA (Japan Automobile manufacturers association) as follows;

- (1) started study in 1996, referencing police data
- (2) 72-89 accident survey based on micro data base
- (3) 88-89 study by computer simulation with pedestrian model
- (4) 90- study test
- (5) 90-95 study for NHTSA system
- (6) improvement point for head impactor
- (7) 94 study compared with EEVC test procedure
- (8) 96 validation on ISO procedure, particularly impact angel and impact mass
- (9) mid 91-96 study on impact test procedure with reference to leg & head

## **9. Introduction of the draft procedure**

Prior to a proposal for drafting the test procedure by Mr. Sasaki, The Convener humbly interpreted this was made in order to initiate the activity as a tentative plan, and requested everyone to do their utmost for responses.

### **9.1 Accident Survey**

Mr. Sasaki gave an overview of plan for accident survey and requested everyone for approval. (Ref. Doc. IHRA/PS/4)

The Convener requested everyone to input us as detailed as possible, gathering accident data from countries.

Mr. Lawrence raised a question concerning the definition of “passenger motor vehicles” used in the passage of the plan, that is difficult to define, stating that this definition is likely to include “buses & coaches” that we wouldn’t like to combine.

Mr. Lawrence suggested, in reply to the Convener’s question about what is the best international definition, that it’s quite appropriate this research word “passenger cars” should be the word the individual country do best interpreted them so as to be able to quote appropriate data. “Passenger cars” include light commercial vehicles, and 4-drive off-road type vehicles as well in UK.

During the discussion of “passenger motor vehicle”, the body understood there was confusion over the terminology, it should be clarified so as to be able to gather

appropriate data from the countries.

The Convener requested everyone to provide us with his revised proposal on this terms and definitions tomorrow.

## **9.2 Review of fruits of past studies, and study on pending technical items**

Mr. Sasaki gave an overview of plan for “review and study” of past studies and requested everyone for approval. ( Ref. Doc. IHRA/PS/5)

The body approved the plan without objections.

## **9.3 Investigation of effect of investment in traffic safety facilities**

This body decided this issue should be left out of plan.

## **9.4 Study of Biomechanics**

Mr. Sasaki gave an overview of plan for “study on biomechanics”.

( Ref. Doc. IHRA/PS/7)

The Convener interpreted the meaning of this plan, stating that there are significant discussions in progress how to do study on biomechanics referencing ; whether it should be done with dummy consuming time and money for development or if this should be done with components.

The Convener requested tomorrow’s detailed discussions, although it will be fallen into endless.

No comments and objections were made concerning Mr. Sasaki’s proposal however, this topic should be discussed further tomorrow.

## **9.5 Preparation of test procedure**

Mr. Sasaki gave an overview of plan for “preparation of unified test procedure”.

( Ref. Doc. IHRA/PS/8)

As far as Article No. 2 on page 1 of this plan, i.e. “the primary draft will be prepared by Japan”, is concerned, the Convener put emphasis on the procedures and roll of Japan, so as not to cause misunderstanding, indicating that Japan volunteered to draft a final report to present to IHRA as a chair country on this matter, after reaching a consensus among countries concerned, by consolidating comments, gathering the activities.

In reference to open issue for tomorrow’s detailed discussion, Mr. Saul raised a question how to build a consensus for development of IHRA, how do you see IHRA

being consolidated by interacting together or separating both EEVC and ISO, because EEVC Draft Directives was already proposed in Europe, while ISO/SC10/WG2 is pursuing Standards.

In reply to his question, the Convener introduced WTO/TBT Agreement(\*), as his individual opinion, stating that once ISO was set up, all country should use them as national standards and regulations, if they don't have appropriate reason.

Under the circumstance, IHRA should consist with ISO by means of harmonization somehow , although, he confessed he doesn't know, which part of them priority should be on.

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 (\*)WTO/TBT Agreement (Agreement on Technical Barriers to Trade) prescribes to be exact as follows;

Where technical regulations or standards are required and relevant international standards exist or their completion is imminent, Parties shall use them, or the relevant parts of them , as a basis for the technical regulations or standards except where, as duly explained upon request, such international standards or relevant parts are inappropriate for the Parties concerned, for inter alia such reasons as national security requirements; the prevention of deceptive practices; protection for human health or safety, animal or plant life or health, or the environment; fundamental climatic or other geographical factors; fundamental technological problems.

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 Mr. Sasaki questioned the priority of both IHRA and ISO which of them should be adopted first, i.e. IHRA should pursue own activities so that ISO might be modified after all, or adopt ISO unconditionally as IHRA's ends.

The Convener answered his question that we have two alternatives for harmonization of the both, during the discussion of test procedures;

- (1) change ISO test procedures so as to be consistent with IHRA requirements
- (2) use ISO test procedures as IHRA's

In response to the Convener's explanation, Mr. Saul showed his concern if same discussion has taken place at the steering committee level of IHRA regarding IHRA and ISO. He felt that other groups, we have 6 projects, may as well have same philosophy.

The Convener felt that only what they concern is conceivably to harmonize IHRA

among countries, without having no interest in ISO.

Mr. Yamaoka recommended, getting back the said issue on definition of “passenger motor vehicle”, that we might as well use the definition quoted by EEVC or ISO or NHTSA ready to hand, for the time being.

## **Day 2 (Wednesday 16 July) Ministry of Transportation, Tokyo**

The Convener opened the meeting at 9:30 with roll call of members newly joined today.

(See attached sheet Appendix 2)

### **1. Accident survey**

Mr. Ishikawa reported the current situation of pedestrian accident in Japan, pointing the significant results with each figure, referencing Doc. IHRA/PS/10, /11,/12.

- (1) Constitution ratio of pedestrian age group by casualties and fatalities is likely as same as in other countries. (Doc. IHRA/PS/10)
- (2) Comparison of injury region by one bonnet type vehicle, cab over engine type vehicle the other showed leg injury with 45% and head injury with 20% by the former, while leg injury with 27% and head injury with 32% by the latter.

(Doc. IHRA/PS/10)

- (3) Comparison of injury region by AIS group with vehicle types showed relatively higher ratio in head injury / lower ratio in leg injury by cab over type against bonnet type vehicle. (Doc. IHRA/PS/10)

- (4) Chart on Relationship between AIS and vehicle speed identified in danger by driver showed that impact speeds were identified in danger with a ratio of 80%

by drivers. (Doc. IHRA/PS/10)

- (6) Serious head injuries were attributed to by hood top / windshield, according to analysis by Table 1 “Number of pedestrian injuries by body regions and contact locations”. (Doc. IHRA/PS/12)

- (7) Leg injuries were caused by bumper / hood edge. And many injuries due to contact with the ground. (Doc. IHRA/PS/12)

- (8) Fig 6 showed the distribution of head impact point by child / adult.  
(Doc. IHRA/PS/12)

Ms. Brun-Cassan questioned, with reference to the above (7), an availability to formulate the data just like in Table 1, but with sever injuries and fatalities which stand for AIS more than 3.

Mr. Ishikawa committed himself to deliver it later on.

Mr. McLean questioned a consistency on both data, shown in Fig. 6 of Doc. IHRA/PS/12 and in Fig. 15 of Doc. IHRA/PS/11. The both are taken from the same source of data, but purpose Fig. 15 draws attention to statue of height of pedestrian having short pedestrians and very tall pedestrians, while Fig. 6 in Doc.12 shows distribution by children / adults. Compared with Fig. 15 which shows only 1 case, we see 6 cases contacting A-pillar in case of Fig. 6.

Mr. Ishikawa responded that data without height of pedestrian was deleted, and not counted in the Fig. 15 which stood for merely “up to 131cm” and “150 or taller”, while all cases, 120 cases, were included in Fig. 6 in Doc.12.

Mr. Saul reported some noticeable data from “Technical Report” (Doc. IHRA/PS/13) from NHTSA issued in 1985, stating it appears to be old based on PICS data from ‘79 to ‘84.

- (1) Fig. 1 shows the distribution of number of pedestrian by age with high peak of 5-6years old.
- (2) Fig. 6 has distribution by body areas on top section which is broader description of body regions, the bottom section shows more fine divided body region.
- (3) Fig. 7 shows distribution by injury source, by what component. Environmental surfaces represent 40% of all injury sources. Hood was 13%, front bumper was 12%.
- (4) Highlight was Table 6 “injury importance by body area, body region and severity”, which shows distribution by body region and broken down by AIS, would show head represents the most important source of injury, followed by thorax.
- (5) Fig. 9 shows injury importance divided out by impact injury source of vehicle. Vehicle face represents nearly 25% of injury importance, then closely distributed by the ground was the 2<sup>nd</sup> important region.

Mr. Saul indicated that it would represent grill, from bumper to before hood, in answer to Mr. Jaehn's question what is front face excepted bumper.

Mr. Jaehn outlined the trend titled "killed pedestrian per 1 million", which shows relatively old figures with the time frame from 1970's to 1975, but wished to look at the trend which has been decreasing in common in Europe.

In reference to Accident survey, the Convener reminded them to propose the definition of "passenger motor vehicle", which was deferred until today's discussion.

## **2. Study on Biomechanics**

Mr. Sasaki gave an overview of the plan for "study on biomechanics".

(Ref. Doc. IHRA/PS/9)

The Convener, in this connection, questioned if members are able to provide additional information or data.

Mr. Lawrence, in answer to the Convener's request, made two comments on this plan, in reference to upper leg section on page 3 of the plan. TNO and TRL decided test conditions on EEVC test methods based computer simulations. With Impactor based on computer simulations and large program testing using pedestrian dummies, they simulated cars, not just computer simulations. They could meet simulations and large program testing whole range of different shape of cars, using both adult and child dummies.

They were dummies, adult dummy with modified to have a greater adoption of pelvis and hips, and it has knee clutches set to 200NM to simulate knee injury as well, cars, full sized cars, constructed with foam and significant parts constructed with foam so as to be able to measure force of inertia.

They conducted in-depth study from 87 to 89, and reported two papers to ESV on 1989.

The 2<sup>nd</sup> point Mr. Lawrence made was that Confor foam does have significant energy absorbing capacity, the party praised the performance of the impactor when testing cars, it will likely pass requirements if this is loaded. This matter was considered at some rank and file of EEVC when they drew up this recommendation.



Mr. Lawrence clarified the properties of “foam” by stating that its ability is to absorb energy but varies in temperature, because it is only capable absorbing load of small amount of energy, significant variation is no very large. When testing cars, it slightly meet requirements. If you test car that has no energy absorbing capacity, that defects foam and temperature on foam will have significant defect. When testing car that has energy absorbing capacity, that effects foam variation of foam by temperature is very small.

Mr. Sasaki questioned if Mr. Lawrence has some temperature data with him concerning upperleg.

Mr. Lawrence indicated that it was from committee paper, not with him.

The Convener suggested that Mr. Sasaki is to rewrite the plan, taking the two comments made by Mr. Lawrence into account.

Mr. Sasaki felt that it wouldn't need to rewrite the plan, but the problems should be noted down in the meeting minutes. Because “the plan” must have included many mistakes or misunderstanding itself.

The body didn't feel the plan is in need for a rewrite.

Mr. Jaehn requested Mr. Lawrence to make his comments more clarify, by questioning if they changed dummies to do testing with cars.

Mr. Lawrence replied that the dummies had been changed that may hit perform in more realistic fashion. So the pedestrian dummy was improved.

Mr. Jaehn questioned further what was a basis for this pedestrian dummy, and where did they take data from to test biofidelity.

Mr. Lawrence outlined, in answer to Mr. Jaehn's question, as follows:

It was a standard dummy biomechanical data taken on the ability of human being to adopt hip joint. Most pedestrian dummies, maybe all dummies, have limitation on movement with joint hip area, and these dummies modified so that it's available, i.e. movement was made most useful so that dummy could hit one side, and hip joint then swing the whole range travel.

And knee clutches will again compare with current biomechanical data for time and test on John Harris conducted with own knees to set a clutch, and also 200NM has been reasonable force.

Mr. Jaehn further questioned Mr. Lawrence on what he spoke of foam, by asking what do they mean by “soft”.

Mr. Lawrence, however, indicated that he didn’t say soft, he didn’t say real cars. Because they can’t measure load in real cars due to inertia problems. These were to simulate cars full size. But the energy absorbing material was selected to be pedestrian friendly, because of its light weight energy absorbing foam one could measure force very small areas due to the inertia of moving material.

Mr. Jaehn raised a question again what does Mr. Lawrence mean by bonnet of soft foam. Because they have been looking for solutions as a manufacturer, and what could be solution for developing pedestrian friendly cars. How did you do it.

Mr. Lawrence indicated that all this was reported in ESV Conferences, but tried to help Mr. Jaehn describe these things.

Car was constructed with immovable energy absorbing foam, for instances, bonnet leading edge was covered layers of mounts 2-3inches of very stiff energy absorbing foam. And bumper region also covered layers of about 100mm very strong energy absorbing foam, and all adjusted so they have generic type car covered whole range. Main phase testing was done at 40km which is the proposed test speed for always registration that EU is considering.

Mr. Jaehn indicated that they have done same test but they couldn’t find a solution.

Mr. Lawrence indicated that there is no suggestion in this car. They presented shape of practical car and it has capacity like a practical car, energy and force calculations, particular force measurement, be made which can not made of practical cars, when you have inertia problems in measurement system.

Mr. Bartolo raised a question if there was no feasibility study from vehicle design impact.

Mr. Lawrence answered with “yes”, and explained as follows;

As well as this study, which was done to aid selection of impact criteria we also produced demonstration car in ‘85 which had lot of features to pass current proposals.

Ms. Brun-Cassan, however, indicated it was never tested according to the actual EEVC procedures.

Mr. Lawrence stressed again that none of modifications for pedestrian purposes effected in car performance in detrimental fashion for other tests, and most of test results showed increased energy absorbing capacity.

Mr. Jaehn pointed out that front impact might cause problems not only the capacity of energy absorption for pedestrian but also that for occupants. Soft nose of car might be much problem for occupants due to more severe accidents.

Mr. Lawrence urged that pedestrian improvement put on the car didn't have any detrimental effect on performance for occupants, only effect they have an extra energy absorbing capacity.

During the discussion on the compatibility of pedestrian and occupants, in this context, Mr. McLean voiced complaint, and registered objection to the questions made by Mr. Jaehn concerning the negative effect of foam on occupants protection, by stating that Mr. Jaehn is a observer, not a official expert, according to Australian Government. Most of questions asked Mr. Lawrence he should not need to ask, and Mr. Lawrence suggesting that modification for front vehicle needs to take into account occupants protection is obvious. Future discussion must be more constructive, otherwise it's waste of time for committee.

The Convener stressed again that participants today were all members recommended by each Government, no observer here. Australian Government rather made misunderstanding on this matter. And the Convener requested members to maintain the constructive discussion.

Mr. Jaehn took back his last question to Mr. Lawrence, admitting it was inappropriate.

Mr. Lawrence presented hesitatingly his tentative suggestion that "passenger motor vehicle" the scope of plan prescribes should be defined M1, N1 incl.

commonly described as cars pick-ups, sports utilities and light commercial van.

Mr. Jaehn suggested they should take as same definition as submitted to EC Commission.

Mr. Lawrence indicated that they had been careful to define them focusing on around European cars to draw up Draft Directives. In the Draft Directives we proposed more restrictive, and it defined M1 and N1 derived M1, that is only commercial vehicles based on cars. We have to take in internationally wants in defining the terms.

The Convener introduced ISO definition to be “vehicles upto 3.5t gross mass”.

Mr. Jaehn proposed to put M1 as interim definition for now, then discuss it at the next meeting, after getting information with reference to another vehicles and figure it more in detail. Because they are unable to figure it out with fatalities and injuries caused by heavier vehicles like light truck.

Mr. Saul also wondered light truck seems to be heavier than we would want to consider for pedestrian safety.

Mr. Lawrence indicated that it's hard to justify the test procedure for such heavy vehicles going into force in Europe, having involved just few accident. We need to consider about another countries, put in American and Australian instances.

The Convener suggested that we first put M1 at least as a interim definition, then we might as well finalize at the next meeting, adding other vehicles on M1, if necessary. In this context, the members were encouraged to provide their proposals and definitions at the next meeting.

The plenary agreed with the Convener's proposal.

The Convener requested that each member investigate accident survey reported by countries, classify data to adopt the data for test procedures.

Mr. Sasaki proposed everyone to input updated data to meet 8 requirements proposed according to “required data” listed in accident survey procedure (Doc.IHRA/PS/4)

Mr. Saul felt that it's probably sufficient with the current data. US is already collecting information, it's very difficult to talk additional information, considering the time frame, though he isn't sure what other countries is doing.

The Convener encouraged everyone to make efforts to gather the updated data and in-depth study available by each county targeted by early spring 1998, although some countries might have difficulties in fact.

The body approved the Convener's proposal without objection.

During the discussion of accident data, the Convener brought the issue up what is a primary body region for test procedure, i.e. leg from the perspective of frequency and/or head from severity.

Mr. Sasaki suggested parallel & simultaneous as a way of approach that member countries should take a roll to address their own allocation in parallel in order to accelerate the procedure by maximizing their time and efforts, since it has taken 10 years in development of EEVC Draft Proposal and been taking more than 8 years for preparation of ISO Working Draft.

Mr. Saul offered a couple of thoughts, in this context, as follows;

In the ESV/IHRA Project Pedestrian Safety Plan, US was proposed to develop full scale crash test dummy, NHTSA, however, has no plan this time at least to develop such dummy. US is proposed their response for that they are to put together draft plan which they can bring back to the meeting next time. Certainly they want to incorporate the pedestrian dummy as one of the thought options, want to include that consideration in possible direction.

However, he personally thought that development of pedestrian dummy is need of a long term process. He suspected that they will have a great difficulty trying accomplishment in 4 to 5 years for time frame.

Mr. Saul further felt that we can see parallel activities the body will take as we have an agreement at the next meeting. And if we use as a basis ISO procedure already developed for leg & for adult head, all of accident data has shown large components of accident cases occurred to children. He guessed maybe attainable goal is to try filing test procedures for child head form. For that purpose, EEVC already has proposal which we might use as a potential basis for that we might want to discuss.

Mr. Saul guessed part of reasons as follows;

Very important issue US is experiencing now is airbag that have already been developed with 50percentile male dummy those are being considerably criticized. It's not providing adequate protection for children and small women. He thought perhaps they should take same consideration than pedestrian issue.

Mr. McLean indicated, in answer to the Convener's query on pedestrian dummy, that there are components test in progress for next 2 years in Australia, it will require works for years to design dummy, build and run prior to validate, although he can see many attractions.

Mr. Lawrence further pointed obvious facts out that the height of dummy to large extent would be defined with head impact locations and prior to putting it into development of dummies we should maybe give some further thoughts to what would be used for. He indicated that they can certainly see margin using it to validate any interactions between component tests, but seem quite a wide range of dummies with different size would be needed for being particularly useful. It would be much more so in a way than for vehicle occupants.

Ms. Brun-Cassan also questioned why Japanese are need for complete dummy, now that we began to work for the component procedure i.e. ISO procedures. It's unable to understand what there will be a relation between two test procedures, and what we can assess with complete dummy test, the result being time consuming.

She also put emphasis on the fact that more biomechanics data are required prior to development.

Mr. Saul supported Ms. Brun-Cassan's opinion, stating that one issue would be having wrap around repeatability with not flexible spines, and doesn't know how flexible spines are in European dummies, but NTHSA's dummy is currently being not flexible spines. Biomechanics data to determine the proper spine flexibility is needed. Also many issues like neck response, head response, thorax response should be decided and come into an agreement.

Due to the body's negative views, the Convener confirmed that we are to leave the pedestrian dummy out from the draft plan, by stating it's hard for 99% to carry it out within the time frame of this project.

the Convener made a proposal to get the investigation started with components (not a dummy) of both head and leg.

Mr. Bartolo suggested that we investigate the EEVC procedure with consideration for containing 6 years child head & leg, but focus on head for 50 percentile adult male, 6 years child head and leg for adult.

Mr. Lawrence indicated in principle we need to establish which zone, who is most risky, and in each area we need to consider whether who is the most risk from the particular parts of car, and design test tools as an appropriate for that person on a basis of lessen risks. We can't have data concerning whole range of impactors representing different ages, but maybe there will be possibility to be able to make use of ISO and EEVC procedures, adjusting the conditions so as to cover from bigger range to smaller range including children and small female.

Mr. Saul raised one point we lost during this discussion that we have to consider the fact that vehicle design and profile has changed over the years, most likely they are continuing too. He indicated that our test procedure is needed to be updated in compliance with future car design and profile, keeping remind us that it's necessary to reflect a change in the process.

Mr. Bartolo raised a question, during the discussion of component testing. He expressed concern from the standpoint of individual component and subsystem testing, i.e. bumper, hood, leading edge. Consideration must be given to the development of a test procedure from a "total systems" approach with regard for all other vehicle requirements. He doesn't know how that fits in, but the issue needs to be presumed on systems basis from the standpoint of manufacturers.

Mr. Lawrence put a question to Mr. Bartolo, stating he is not quite sure what you mean by systems.

Mr. Bartolo took an instance of bumper to explain the meaning of system as follows;

A pedestrian friendly bumper may result in conflicting constraints required to meet other regulatory standards like bumper damageability, crashworthiness or projections. For example, head impact testing and design of hoods must take into consideration the complete vehicle effects like; underhood engine package, proximity of hardpoints and driver visibility.

Mr. Lawrence replied to Mr. Bartolo's indication that, speaking of compatibility, part which has to be pedestrian safety also has to serve as functions, and the hood areas as well as providing head protection also has to have for engine and center

pieces which keeps car going. He felt that to a degree these problems are to be addressed by political decision. You have test method that is to assess the safe car / risks, some contradiction between requirements all having crash performance and essential components. Then to a degree those problems can be resolved by changing design, maybe there is a need for some compromise. Those decision do not be on the part of designer of test methods, more political decision as to how much efforts put in, how many people we can try to save.

Mr. Bartolo agreed with Mr. Lawrence, stating that it is probably a complex issue that requires thorough consideration.

Mr. Jaehn, however, raised a question to Mr. Bartolo regarding soft bumper that they might fail in occupants test, i.e. front impact test, because changing to flexible grill that might be possible to certain extent, but that forces industries to develop new restraint system that ensures more occupants protection costing for development of new restraint system. They have to face contradiction, i.e. pedestrian safety is one thing, occupant safety and other car requirements another.

Mr. Bartolo answered that he wasn't trying to suggest one of trade-off commercial aspects for pedestrian safety aspect, which are difficult decisions some body must make at some point in time. What he is trying to say from stand point bumper softness, they got now even more detailed on bumper damageability requirements in the US and Europe, lower speed impact damageability for insurance ratings, crash sensor deployment, and the implications of making minor changes that a involve systems approach. Guessing from components test standpoint, the best solution in an isolated environment for head impact protection will perform differently with each engine package, that may affect results from the systems complexity point of view. Again Mr. Bartolo emphasized the necessity for taking a viewpoint from a total systems and vehicle perspective.

Mr. Lawrence pointed out that there would be one slight misconception during the discussion on the soft bumper, stating pedestrians are comparative tough and the requirements are near limit what human can injure. So spoke of soft bumper, it's not so soft as to what we visualize, test procedure with current cars could pass at ease meeting bumper requirements, presuming to provide best occupants



protection. It's possible to design bumper systems that would be pedestrian friendly, and also perfect design bumper compatible with pedestrian requirements, occupants protection requirements and vehicle design requirements.

The Convener proposed members to reach a consensus concerning items to initiate, stating "start study focusing on component tests procedures for adult and child head".

Mr. Sasaki, however, questioned what the Convener means by "start study", if it means drafting procedures from now on or not.

The Convener interpreted the purpose of this group that is to propose a reasonable test procedures, drafting the test procedure. But investigations are needed to initiate, prior to drafting.

Mr. Sasaki couldn't understand further. there was insignificant discussions among the Japanese as to how to do "start study".

Mr. Ishikawa indicated that he found some significant injury distributions that differs from vehicle shape according to the recent data which was reported this morning. He is concerned that EEVC test procedures are based on old accident data 10 years before, in particular as far as bonnet leading edge test procedure for upper leg is concerned, the 20 Euro cars couldn't meet the requirements of EEVC test procedures posed by Euro NCAP test.

He also indicated that he couldn't see any severe injuries in the latest models, and pointed out a need for further information gathering recent accident data.

Mr. Jaehn agreed to Mr. Ishikawa's proposal of gathering recent data, by stating they are prepared to get data at least since half a year or a year ago for the next meeting.

Mr. Yamaoka expressed his concern about technical materialization (i.e. system) of a car itself, requested to address the issue in more detail and timetable that they expect to follow in the course of technical investigation proposed by the plan (IHRA/PS/2) possibly at the next meeting.

Mr. Yamaoka further committed himself that JAMA will be prepared to come up with a technical investigations, and will request ACEA and AAMA to deal with the issue together.

The Convener brought a question up what the items or issues are to be addressed at the next meeting, whether or not accident data are updated by the next meeting.

Because if this working group does not taking any action to go on, the process will fall further and further behind.

Mr. Lawrence interpreted the bottleneck we are encountering and suggested as stated below;

There appears to remain a need unchanged for updated accident data and for discussion on how we can gather accident data to proceed with the test procedures though. His suggestion is that we start drafting on a basis of existing such test procedures as ISO / EEVC given sanction to accident data currently available, although the number of pedestrian injuries are dramatically declining.

Still we need for significant test tools that is being discussed by ISO and EEVC. We should work on a basis of those test methods adopting in IHRA. As soon as accident data that is to be updated conflict with those sanctions, then add to test procedures or modify test procedures.

Mr. Ishikawa agreed to start drafting with head and leg test procedures while he stressed again the need for new accident data in other test methods.

Mr. Lawrence pointed out that concerning upper leg test by EEVC, since the 1<sup>st</sup> development, the criteria was derived from weak people based on very limited accident cases. There used to be tend to select weak people in proportion to strong people. Since then they have improved impactor, having reconstructed based on a limited number accident cases. Their findings are the fact that they had again weak people. Only problem with upper leg test procedure is that the criteria need for a review, and currently they are officially square bracketed.

Despite Mr. Lawrence and Mr. Ishikawa's suggestions, the Convener didn't clarify the said two alternatives but repeated to bring a question up what the items or issues could be addressed at the next meeting, and requested members to get back with the updated data, stating that in order to "combine many things he would like you to study, based on accident studies presented yesterday and today. Items to study or start with maybe be head for adult & child and leg for adult, although final proposal should reflect updated data."

The Convener felt that Japan will be able to submit new data at the next meeting, and expressed his expectation that US, UK, France and Germany could gather data.

Mr. Lawrence responded that he would try to ask German data, since UK data base has not yielded any in-depth results yet.

Mr. McLean felt that Australia could input excellent data by this fall.

The Convener requested members, getting back to the said alternatives in this context, if how we should get the issue concluded.

Mr. Saul pointed out that if we look at child head test procedure, how we could compare US's and EEVC's in terms of child head mass. That would be potential topic that needs for discussion and agreement. Another point is as to how we obtain access to biomechanics, some discussions among this experts group will help us better understanding.

Mr. Jaehn raised a question with reference to biomechanical data if we should wait for studies some countries work out, or adopt studies from EEVC or ISO. He requested to make direction clarify.

The Convener, however, appreciated Mr. Jaehn's indication, stating that is good point. And asked members availability of new data before long.

Mr. Ishikawa clarified their prospect with regard to high speed impact tolerance of knee joint that is scheduled to be presented at the STAPP Conference. Hopefully they are inputting to us in detailed after STAPP.

Ms. Brun-Cassan confirmed that Mr. Ishikawa is going to present a new biomechanical data (incl. knee characteristic ) at STAPP Conference, and that was lately performed based on a "cadaver test".

Mr. McLean felt that, as far as head tolerance is concerned, he wouldn't expect significant additional information be in next 1-2 years, but maybe might be in 2-3 years.

During the discussion of new biomechanical data, Mr. Sasaki raised again a need for data for the development of full scale dummy.

The Convener interpreted that the issue is hardly to perform within term, stating “it’s nearly impossible to include in the project, because of time frame, according to Mr. Saul’s explanation. But we would like you to provide us with the updated information and situation”.

Mr. Saul briefly replied that we will take a look at and see we think required.

The Convener suggested in this context that we should use tentatively components test.

Mr. Saul indicated that thorax would be the significant body region to deal with at the next stage, taking it into consideration for development of the plan.

In reference to study of “infrastructure” described in 5-4 on page 4 out of the plan (IHRA/PS/3), after investigation and discussion based on Mr. Lawrence’s modification on infrastructure, i.e. “infrastructure would not be undertaken, but the value of infrastructure should be acknowledged”, the article was proposed by Mr. McLean and changed to;

“The study of the effects of investment in traffic safety facilities (infrastructure) is not within the scope of the work of this group. However the importance of the role of the traffic safety infrastructure in pedestrian safety is acknowledged.”

Mr. Bartolo indicated in this context that the importance of education and infrastructure should be stressed more for reduction of number of accidents. Although he doesn’t necessarily disagree with the proposed sentence, he felt that the group doesn’t need take a more works on infrastructure. However he indicated that these factors must be understood and taken into account when one decides which measure is most effective. He suggested that in order to reduce the incidence number, two way of contributions taken by industries and rule maker are measurable, giving an quotation that is related to the tendency in the State that fatality rates are much higher on rural streets rather than on urban streets due to the higher rate of speeds involved where vehicle designs may not be effective and each local area may have a different situation.

Mr. Jaehn committed himself that they will be able to provide us with recent investigation on infrastructure measures, having asked local Government about a course of single measures to protect pedestrian.

They investigated the data before and after measuring, what happened by a new single measure. He felt that this investigation will help us to consider and decide to use test procedures.

Mr. Saul indicated that this included from one source, but pedestrian situations are very different from base countries.

Mr. Jaehn replied that they are able to provide data from 2 or 3 countries, not all over the countries.

The Convener interpreted the status of “infrastructure and education” to be exact as follows:

“Our task is to propose test procedures for pedestrian safety, but to promote pedestrian safety, there are many measures, including infrastructure improvement, education, ITS accident avoidance etc. But we should focus on vehicle vs pedestrian within our team, touching on “infrastructure & education in the “introduction”.

The body further couldn't come an agreement on this description of “infrastructure” proposed by Mr. McLean, the Convener requested members to submit their comments / modifications / proposals in writing for finalization at the next meeting.

The body agreed to hold the meeting twice a year between steering committee, supposed in Feb in the State, in conjunction with SAE Conference.

The Convener adjourned the 1<sup>st</sup> expert meeting at 16:30, 16 July 1997.

He thanked everyone for a successful meeting.

